THE ROLE OF WATER SCARCITY IN THE VENEZUELAN PREDICAMENT

EXAMINING THE EFFECT OF DROUGHT AND WATER MANAGEMENT ON THE CURRENT SOCIOECONIMC AND POLITICAL SITUTATION

by
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Abstract

Venezuela is a nation in decline. Despite vast petroleum reserves, decades of disastrous policies enacted by increasingly authoritarian regimes led to socioeconomic and political descent, including increased poverty, food insecurity, and rationing of water and electricity. Recently, Venezuela's tailspin has coincided with a severe multi-year drought, ranging from 2013 to 2016. This study seeks to determine the effect of this drought on the current turmoil in Venezuela, examining the oft-debated theory that environmental scarcity may cause conflict. This assessment begins with a review of the relevant scarcity-conflict literature, which highlighted the importance of both environmental factors and water management policy when evaluating water scarcity. With this important bifurcation in mind, the study uses a quantitative assessment to determine if there is a statistical relationship between drought and intrastate conflict in Venezuela and Syria. Case studies provide a more nuanced assessment of socioeconomic factors and the effectiveness of water management during times of drought. Ultimately, the quantitative data did show a minor relationship between drought and political stability in Venezuela and Syria, particularly when accounting for the delayed effects of drought. The case studies highlight the importance of effective water management policy in addressing drought. Years of neglect and ineptitude left Venezuela with a deteriorating infrastructure, insufficient for proper water and electrical management prior to the 2013 drought. While the data suggests that the drought did aggravate the situation in Venezuela, it became increasingly apparent that preexisting infrastructure deficiencies were largely responsible for water scarcity and thus played a much greater role in the current situation.

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Contents

List of Figures

Introduction

Venezuela has been in a steady socioeconomic and political decline since former President Hugo Chavez began his "experiment with 21st century socialism" upon his 1999 election.[1] The descent continues as Chavez's replacement, Nicolas Maduro, has sustained the "chavismo" governing style best summarized as "failed socialist policies—price and currency controls, farm and factory nationalizations, [and] government control of food distribution…" accompanied by widespread corruption, "cronyism, and plain incompetence."[2] The Venezuelan gross domestic product (GDP) has declined nearly 50 percent since Maduro's 2013 ascension to the presidency, coupled with a 70 percent reduction in imports.[3] In the wake of this economic decline, 87 percent of Venezuelan households are in poverty, with over 60 percent living in extreme poverty.[4] The resulting "humanitarian crisis" and an increasingly authoritarian Maduro government has led to "the largest migration and refugee crisis the Western hemisphere has seen in modern history."[5] In June 2019, the United Nations announced four million Venezuelans had sought refuge beyond its borders,[6] rivaling the exodus of Syrians in 2013 and 2014. The magnitude of Venezuelan migration has placed a significant amount of stress on the entire region and poses a substantial international challenge.[7] Those that have remained in the

[1] Moises Naim and Francisco Toro, *Venezuela is Falling Apart*, THE ATLANTIC (May 12, 2016), https://www.theatlantic.com/international/archive/2016/05/venezuela-is-falling-apart/481755/.
[2] Uri Friedman, *How Populism Helped Wreck Venezuela*, THE ATLANTIC (June 4, 2017), https://www.theatlantic.com/international/archive/2017/06/venezuela-populism-fail/525321/ *see also* Naim.
[3] Dany Bahar, Ted Piccone, and Harold Trinkunas, "Venezuela: A Path out of Misery," *Foreign Policy at Brookings*, (October 2018): 3, 4.
[4] *Id.* at 4.
[5] *Id.* at 4.
[6] UN News, "Four million have now fled Venezuela, UN ramps up aid to children who remain," (June 7, 2019), https://news.un.org/en/story/2019/06/1040001.
[7] Bahar, *supra* at 1, 5.

country have voiced their displeasure through widespread protests and growing support of opposition leader Juan Guadio.[8]

There is not one simple reason for the Venezuelan crisis. The successes and failures of all nations, and societies in general, are the net sum of intricately woven social, political, economic, and environmental factors. The systemic failure in Venezuela is undoubtedly a complex and multi-faceted phenomenon. However, it is of note that in recent years this crisis has coincided with a severe multi-year drought, from 2013 to 2016.[9] While drought in the region is not uncommon, this particular drought has been labeled by Venezuelan meteorologists as the most severe in at least the last forty years.[10]

This is significant as the United Nations, in its 2019 Global Assessment Report on Disaster Reduction Risk, classified drought as "probably the most complex and severe" weather event "due to its intrinsic nature and wide-ranging and cascading impacts."[11] Drought affects a multitude of systems, ranging from agricultural yield to energy production.[12] The impacts "develop slowly, are often indirect and can linger for long times after the end of the drought," and the effects are less apparent than those of other natural disasters.[13] Such effects are often difficult to conceptualize due to drought's "creeping" nature and the lack of a universally applicable definition of "drought," resulting from the array of geographically diverse climates.[14]

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[8] BBC, "Venezuela protests: 'Four dead' as thousands rally against Maduro," (Jan. 23, 2019): https://www.bbc.com/news/world-latin-america-46970620.
[9] Jean Chemnick, "Where Climate Change Fits into Venezuela's Ongoing Crisis," *Scientific American E&E News: Climate,* (February 18, 2019), https://www.scientificamerican.com/article/where-climate-change-fits-into-venezuela-rsquo-s-ongoing-crisis/.
[10] Keith Schneider, "Venezuela Drought Aggravates Instability," *Circle of Blue* (June 10, 2016), https://www.circleofblue.org/2016/world/venezuela-drought-aggravates-instability/.
[11] Global Assessment Report on Disaster Risk Reduction (GAR) (2019), Chapter 6, 171, https://gar.unisdr.org/report-2019.
[12] *Id.* at 171.
[13] *Id.* at 171.
[14] *Id.* at 193.

Over the past few decades, scholars have debated the impact of environmental scarcity on both intra- and interstate conflict.[15] As will be examined below, conclusions have varied as to whether environmental scarcity, to include water scarcity, increases the probability of political unrest and conflict. While there is an apparent dichotomy among the scholars as to whether scarcity increases the risk of conflict, there is generally more nuance to the debate than a simple "yes or no" answer. There is an apparent consensus, however, that it is a complicated issue.

Water scarcity itself is a multifaceted issue, as it "can mean scarcity in availability due to physical storage, or scarcity in access due to the failure of institutions to ensure a regular supply or due to a lack of adequate infrastructure."[16] As a result, both the environment and the effectiveness of water management are contributory factors. Effective management will reduce vulnerability and alleviate the effects of drought. Conversely, poor management policies can amplify the effects of drought and increase the likelihood of scarcity. Reduced precipitation does not necessarily cause water stress, but poor management will increase the likelihood of scarcity.[17] Understanding the role of water management is critical to assessing the true impact of drought, as ineffective management can lead to scarcity even during times of environmental abundance.

The objective of this study is to assess the impact of the 2013 drought on the current socioeconomic and political state of Venezuela, which will include an assessment of Venezuelan water management. As drought becomes increasingly persistent and severe in many areas of

[15] *See generally* Theodora-Ismene Gizelis and Amanda E. Wooden, "Water resources, institutions, & intrastate conflict," *Political Geography* (29) (2010): 444-453.
[16] United Nations, "Water Scarcity," *UN Water: Water Facts; Scarcity*, https://www.unwater.org/water-facts/scarcity/.
[17] Hussam Hussein, "Lifting the veil: Unpacking the discourse of water scarcity in Jordan," *Environmental Science and Policy* 89 (2018): 385-392.

the world due to the effects of climate change,[18] many nations will be forced to confront the bevy of complex challenges that accompany drought. Venezuela provides an example of a nation that was confronted by drought while in the midst of socioeconomic and political bedlam, a situation not unique to many of the world's most water stressed nations.[19] The importance of this research question is twofold: to determine the impact of the Venezuelan drought and provide insight into the role of effective water management in mitigating the effects of drought. Hopefully, this will add to our understanding of the effects of drought and the role that water management must play to combat the effects of climate change. This is of critical importance as approximately one-quarter of the world lives in regions with "'extremely high' levels of baseline water stress."[20]

While Venezuela is yet to reach the depths of civil war, there has been a bubbling of intrastate conflict in the form of civil unrest, political protest, and opposition movements. To assess the impact of the drought, I will take a two-step approach. First, I will perform a brief quantitative analysis specific to the effects of drought on political stability within Venezuela and Syria. I choose Syria as many experts have opined that drought was a significant factor in the current civil war. I will then turn to case studies of Venezuela, Syria, Turkey, and Uzbekistan to look more broadly at socioeconomic factors and water management policy.

Literature Review

There is notable disagreement within the literature as to whether the evidence supports a finding that environmental degradation, to include water scarcity, is a primary or contributory

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[18] United Nations, "Water Scarcity," *UN Water: Water Facts; Climate Change*, https://www.unwater.org/water-facts/climate-change/.
[19] Paul Reig, et. al, "World's 36 Most Water-Stressed Countries," *World Resource Institute* (Dec. 12, 2013), https://www.wri.org/blog/2013/12/world-s-36-most-water-stressed-countries.
[20] Rutger Willem Hofste, et. al, "17 Countries, Home to One-Quarter of the World's Population, Face Extremely High Water Strees," *World Resources Institute*, (August 6, 2019), https://www.wri.org/blog/2019/08/17-countries-home-one-quarter-world-population-face-extremely-high-water-stress.

factor in conflict. As noted, this research question will focus primarily on intrastate conflict. Thomas Homer-Dixon is perhaps the most recognized scholar in the camp that argues there is a strong correlation between environmentally related scarcity and conflict. He theorized that scarcity would result in "sub-national, persistent, and diffuse" conflict[21] and identified six specific types of "environmental change" that may result in violent conflict, including "depletion and pollution of fresh water supplies."[22]

Robert Kaplan built upon the earlier work of Homer-Dixon, concurring with his opinion that "future wars and civil violence will often arise from scarcities of resources such as water…."[23] Kaplan characterized the environment as a "hostile power" analogous to a rival nation state and suggested that environmental stress would fundamentally alter nation states, resulting in "totalitarianism (as in Iraq), fascist-tending mini-states (as in Serb-held Bosnia), or road-warrior cultures (as in Somalia)."[24] Accordingly, environmental hostility could cause or aggravate future subnational conflict and ignite cultural and "tribal" divides that would ignore national borders and ultimately lead to the demise of susceptible nation states.[25] This mirrored Homer-Dixon's theory that intranational conflict stemming from environmental degradation would likely result in either the "fragment[ation]" or hardening of states in the form of increased authoritarianism.[26]

While Homer-Dixon and Kaplan addressed environmental scarcity more generally, Cullen Hendrix and Idean Salehyan completed a focused assessment on the relationship between rainfall deviation and intrastate conflict. They found a "curvilinear relationship

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[21] Thomas F. Homer-Dixon, "Environmental Scarcities and Violent Conflict: Evidence from Cases," *International Security* 19 (1) (Summer 1994): 6.
[22] *Id.* at 6.
[23] Robert D. Kaplan, "The Coming Anarchy: How scarcity, crime, overpopulation, tribalism, and disease are rapidly destroying the social fabric of our planet," *The Atlantic Monthly*, (Feb. 1994): 59.
[24] *Id.* at 57-59.
[25] *Id.* at 74, *generally*.
[26] Homer-Dixon, *supra* at 40.

between rainfall and social conflict," including both positive and negative deviations from the mean: both drier and wetter conditions could lead to increased incidents of political conflict.[27] Their definition of conflict encompassed a "broad[] spectrum of social conflict" and "demonstrate[d] a robust relationship between environmental shock and unrest."[28]

In a 2017 report, CNA evaluated the relationship between water scarcity and intrastate/interstate conflict, using the framework of a conflict continuum, which included: "Civil Unrest and Instability"; "Localized Violence"; "Terrorism, Insurgencies, and Civil Wars"; and "State-on-State Conflict."[29] Ultimately, CNA concluded that water scarcity can be the primary cause of "civil unrest and localized violence….[w]hen combined with other negative factors such as poor governance, poor water management practices, or preexisting social tensions."[30] In addition, it can act as a contributory factor in intrastate conflicts.[31]

In a 2012 study focusing on sub-Saharan Africa, Conor Devitt and Richard Tol opine that "drought does impact the probability of civil war," even after a sensitivity analysis accounting for non-climate related risks of conflict.[32] Their study included an in-depth analysis of a feedback model involving climate change, civil war, and economic growth. Ultimately, they reached the intuitive conclusion that "[e]conomic growth reduces the probability of civil war and the vulnerability to climate change," to include drought.[33]

On the other side of the spectrum, Ole Magnus Theisen argues that data does not support the hypothesis that environment scarcity leads to conflict. Rather, he asserts that

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[27] Cullen S. Hendrix and Idean Salehyan, "Climate Change, rainfall, and social conflict in Africa," *Journal of Peace Research* 49(1) (2012): 46.
[28] *Id.* at 35.
[29] CNA, "The Role of Water Stress in Instability and Climate" (2017): 13, https://www.cna.org/CNA_files/pdf/CRM-2017-U-016532-Final.pdf.
[30] *Id.* at 2.
[31] *Id.* at 47.
[32] Conor Devitt and Richard SJ Tol, "Civil war, climate change, and development: A scenario study for sub-Saharan Africa," *Journal of Peace Research,* Vol 49(1), Special Issue: Climate Change and Conflict (January 2012): 129-45, 131.
[33] *Id.* at 141.

"proxies for development, state strength and institutional instability" are much greater indicators of conflict than resource scarcity.[34] In a 2012 case study of Kenya, Theisen determined that contrary to the scarcity-conflict theory, conflict was actually more likely in the aftermath of "wetter years" than in years with less precipitation. He attributes this to the difficulty of mounting any type of opposition or initiating violence during times of scarcity.[35]

In a subsequent article, Theisen collaborated with Helge Holterman and Halvard Buhaug to dispute the common assertion that climate change would directly cause conflict, as such a theory is not supported by "solid scientific evidence." They critique reports by the United States Military, Intelligence Community, and statements by President Obama. Theisen et. al. distinguish the purported climate-conflict link from the clear scientific evidence supporting projected climatic changes.[36] In providing "a rigorous assessment of the claim that drought and water shortages increase the risk of civil war" with a focus on African countries,[37] they ultimately conclude that "there is no direct, short-term relationship between drought and civil war onset, even within contexts presumed most conducive to violence."[38] Their study suggests that reported scarcity conflicts were actually rooted in ethnic and cultural divisions.[39]

Nils Petter Gleditsch and Ragnhild Nordas agree, opining that the concern over climate related conflict is based on little evidence. They critique the Intergovernmental Panel on Climate Change for "fall[ing] prey to the temptation of relying on second- or third-hand information with little empirical backing in its scattered comments on the implications of

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[34] Ole Magnus Theisen, "Blood and Soil? Resource Scarcity and Internal Armed Conflict Revisited," *Journal of Peace Research* 45 (6) (2008): 814-15.
[35] Ole Magnus Theisen, "Climate clashes? Weather variability, land pressure, and organized violence in Kenya: 1989 – 2004," *Journal of Peace Research,* Vol 49(1) Special Issue: Climate Change and Conflict (January 2012): 81-96, 93.
[36] Ole Magnos Theisen, Helge Holtermann, and Halvard Buhaug, "Climate Wars? Assessing the Claim That Drought Breeds Conflict," *International Security* 36(3) (Winter 2011/12): 79.
[37] *Id.* at 80, 102.
[38] *Id.* at 105.
[39] *Id.* at 106.

climate change for violent conflict."[40] While acknowledging the work of Homer-Dixon and similarly minded theorists, they highlight the difficulty of establishing a scarcity-conflict relationship as "it was impossible to generalize from studies only of cases with conflict."[41] Conversely, they reference a 2005 study by Indra De Soysa[42] contending that "resource abundance, particularly in poor countries with weak institutions, have a greater impact on conflict than resource scarcity."[43] Ultimately, Gleditsch and Nordas appear to fall short of manifestly rejecting the scarcity-conflict hypothesis, instead concluding that the Homer-Dixon based "folk wisdom" is unsupported by current data and that "there is little if any solid evidence that we are going to see an increase in armed conflicts as a result of climate change."[44]

Gregory Dunn came to a similar conclusion regarding water scarcity: "[w]hile the degradation of natural resources is a serious problem with modern society, the lack of water wars serves as a reminder of the power of forces of peace and prosperity that are an inherent part of the modern world."[45] Dunn acknowledges that water shortages will most deeply impact those citizens of a nation with less political power and economic resources, potentially resulting in an insurgency. While Dunn asserts that such an insurgency would have little actual impact on that country,[46] this seems to be a somewhat contradictory finding as an insurgency would amount to civil conflict.

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[40] Nils Petter Gleditsch and Ragnhild Nordas, "Climate Change and Conflict: A Critical Overview," *Die Friedens-Warte, Sonderausgabe* (2010): 8.
[41] *Id.* at 9.
[42] Indra de Soysa, *Filthy Rich, Not Dirt Poor! How Mother Nature Nurtures Civil Violence* (2005) (in Peter Dauvergne (ed.): International Handbook of Global Environmental Politics (London: Elgar) p. 149-169.
[43] Gleditsch*, supra* at 9.
[44] *Id.* at 18.
[45] Gregory Dunn, "Water Wars: A Surprisingly Rare Source of Conflict," *Harvard International Review* 35 (2) (Fall 2013): 49.
[46] *Id.* at 49.

Beyond the scarcity-conflict nexus, Hussam Hussein explains that water scarcity may be the result of two separate entities: "water insufficiency and water mismanagement."[47] Water insufficiency may result from climate, specifically drought, while water mismanagement is the result of poor policy specific to water resources. The aforementioned CNA report expands upon Hussein's water scarcity model, highlighting "poor water management, dwindling aquifers, demographic changes that increase demand for more water-intense food, and the growing use of water resources in energy production."[48] As will be discussed below, the reliance on water for energy production is a critical issue in Venezuela.

Hussein Amery establishes five specific phases of "water development, supply and management" as a country develops and water management evolves: (1) Manual supply phase; (2) Mechanical supply phase; (3) Early conservation phase; (4) Intermediate conservation phase; and (5) Advanced conservation phase.[49] He provides an insightful analysis as to how various nations in the Middle East, among the world's most water stressed regions, have approached water management.[50] Understanding the importance of water management, the natural follow-up question is: what constitutes good water management?

In assessing water security in the historical *Levant* region, Ido Bar and Gerald Stang highlight three critical components to an effective water management strategy: (1) conservation efforts to "match[] demand with sustainable supply"; (2) "greater diversification of water sources"; and (3) "investment in infrastructure…including transport and storage facilities and

[47] Hussam Hussein, "Lifting the veil: Unpacking the discourse of water scarcity in Jordan," *Environmental Science and Policy* 89 (2018): 385-392.
[48] CNA, *supra* at 1.
[49] Hussein Amery, "Water-Demand Management in the Arab Gulf States: Implications for Political Stability," in *Water Security in the Middle East: Essays in Scientific and Social Cooperation,* ed. Jean Axelrad Cahan (London, UK; New York, NY, USA: Anthem Press, 2017), 69.
[50] Reig, *supra.*

the development of sustainable sources."[51] Effective water management is in essence finding a balance between "demand reduction" and "supply improvement." Bar and Stang emphasize management efforts "should not occur in isolation but as part of integrated water management systems that take into account changing resource availability, climate impacts and population needs when planning infrastructure and agriculture."[52] This "comprehensive approach," they argue, is necessary to adequately address the various political, security, economic, and environmental issues that are intertwined with water availability.[53]

Katharine Jacobs and other experts also tout the need for a comprehensive approach, highlighting the technical and political challenges associated with water management "for sustainable use and economic development."[54] These challenges, they argue, are best met by policy which fully considers the full spectrum of relevant issues: "To be effective, knowledge systems that support decision about water-resource management and development must link research- and experience-based knowledge to practices across a broad range of challenges."[55]

Bar and Stang note that the European Union has been at the forefront of the comprehensive approach, as indicated in part by the European Council's 2013 "new conclusions on water diplomacy…prioritising [sic] integrated and cooperative responses" to help address the nexus between water scarcity, security, and water management.[56] The Organisation for Economic Cooperation and Development (OECD) has praised the work of the European Union, stating that the EU Water Framework Directive has been one of the "legal frameworks [to] have

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[51] Ido Bar and Gerald Stang, "Water and insecurity in the Levant," *European Union Institute for Security Studies*, Brief Issue 15 (2016), 4.
[52] *Id.* at 4.
[53] *Id.* at 3.
[54] Katharine Jacobs, et. al, "Linking knowledge with action in the pursuit of sustainable water-resources management," *Proceedings of the National Academy of Sciences of the United States of America,* Vol. 23 (17) (April 26, 2016), 4591.
[55] *Id*. at 4591.
[56] Bar, *supra* at 3.

triggered major evolutions in water policy," despite facing some "governance bottlenecks."[57] OECD's "Principles on Water Governance" apply many of the EU's water management strategies.

The OECD acknowledges that "[w]ater policy is inherently complex and strongly linked to domains that are critical for development, including health, environment, agriculture, energy, spatial planning, regional development and poverty alleviation."[58] It further explains that there is a growing understanding that "bottom-up and inclusive decision-making is key to effective water policies," yet the comprehensive approach "has brought uneven results within and across countries," in part due to failures to properly account for "the short, medium and long term in a consistent and sustainable way."[59] Importantly, OECD notes "that there is not a one-size-fits-all solution to water challenges worldwide," and that appropriate policy must account for specific national and regional context.[60] To help address the challenges of water governance, OECD presents 12 specific "Principles" of water management, premised on three foundational, "mutually reinforcing and complementary dimensions of water governance": (1) effectiveness; (2) efficiency; and (3) trust and engagement.[61] OECD's assessment that "[w]ater crises are often primarily 'governance' crises"[62] mirrors Bar and Stang's conclusion that "in richer countries, resource challenges are less about availability than about prioritization, management and governance. Water is both a technical and a political issue."[63]

Jeannie Sowers evaluation of water scarcity in the Middle East provides discussion of the water-energy nexus, relevant here due to Venezuela's heavy reliance on hydropower. She

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[57] OECD Principle of Water Governance, *Organisation for Economic Cooperation and Development* (2015), 3, https://www.oecd.org/cfe/regional-policy/OECD-Principles-on-Water-Governance.pdf.
[58] *Id.* at 2.
[59] *Id.* at 3.
[60] *Id.* at 3.
[61] *Id.* at 3, 9-12.
[62] *Id.* at 2.
[63] Bar, *supra* at 3.

highlights the intuitive conclusion that an increasing reliance on hydropower heightens the importance of the water-energy nexus. More importantly though, she directs the discussion of water scarcity away from water stress indexes and statistics, such as precipitation, often cited by policymakers. Rather, she notes the well understood premise that "water and energy vulnerability is not simply equivalent to scarcity of the resource."[64] Water management is most effective when understanding "vulnerability and risk in relation to the basic uses of energy and water," rather than focusing on physical scarcity.[65] Much of the vulnerability, she argues, is dependent "upon government policies and infrastructure, economic purchasing power and other factors not reducible to physical scarcity."[66] Relevant to the discussion below, she notes that the over-extraction of groundwater is a common mistake.[67]

The importance of water governance in the scarcity equation is becoming increasingly well understood. The United Nations has created a "User's Guide on Assessing Water Governance" to help address what it has determined to be "one of the major global challenges today…"[68]

> The *governance* of available water resources becomes the key issue to achieve water security at the local, regional, and global level. Poor resource management, corruption, lack of appropriate institutions, bureaucratic inertia, insufficient capacity and a shortage of new investments undermine the

[64] Jeannie Sowers, "Water, Energy and Human Insecurity in the Middle East," *Middle East Report,* No. 271, *Fuel & Water: The Coming Crises* (Summer 2014), 3
[65] *Id.* at 2.
[66] *Id.* at 2-3.
[67] *Id.* at 4.
[68] United Nations Development Programme, "User's Guide on Assessing Water Governance," (2013), 2, https://www.undp.org/content/undp/en/home/librarypage/democratic-governance/oslo_governance_centre/users-guide-on-assessing-water-governance.html.

effective governance of water in many places around the world.[69]

The World Resources institute has begun the process of creating a "global comparable geodatabase of public water management indicators to spur tangible improvements in water management."[70]

While the literature is full of work assessing the scarcity-conflict nexus and outlining effective water management, there does not appear to be as much work encompassing the full spectrum of management, scarcity, and intrastate conflict. By assessing the effects of drought and water management on intrastate conflict in Venezuela, this study will prove a useful addition to the literature and help bridge an apparent gap between the scarcity and management literature.

Hypothesis

I hypothesize that the drought between 2013 and 2016 significantly contributed to water scarcity in Venezuela, which in turn has severely aggravated the preexisting socioeconomic and political disorder, contributing to a greater degree of civil unrest and instability. For this study, intrastate conflict will generally refer to the first two categories of the aforementioned CNA conflict spectrum: civil unrest and instability, and localized violence.[71] I am not suggesting that the drought is a primary cause of the turmoil or that Venezuela would have rebounded in the absence of drought. Rather, I hypothesize that the drought had a significant negative impact on the ongoing crisis, in part due to critical vulnerabilities stemming from poor water management policies of the Maduro regime. Thus, drought and poor water

[69] *Id.* at 2.
[70] Julian Kolbel, et. al, "Mapping Public Water Management by Harmonizing and Sharing Corporate Water Risk Information," *World Resources Institute* (March 2018), 1, https://www.wri.org/publication/mapping-public-water.
[71] CNA, *supra* at 19.

management in Venezuela led to significant water scarcity from 2013 to 2016, which in turn directly and indirectly impacted a number of preexisting economic, political, and social issues. The graphic below illustrates this:

Figure 1

Method

To test this hypothesis, I will consider the two questions presented by the literature above: the causative effect of water scarcity on intrastate conflict and the impact of water resource management on scarcity. First, I will perform a brief quantitative analysis to assess the correlation between drought and intrastate conflict, as defined above. This will be done with a bivariate regression to assess whether there is a relationship between measures of drought and political instability. I will use an index of "Political Stability and Absence of Violence/Terrorism" compiled by the World Bank in its Worldwide Governance Indicators (WGI) project.[72] The WGI explains that this index "measures perceptions of the likelihood of political instability and/or politically-motivated violence."[73] To quantify the degree of drought, I will use findings from the Standardised Precipitation-Evapotranspiration Index.[74] Political stability and the absence of violence will be the dependent variable. Drought will be the independent variable. My assessment will focus on Venezuela and Syria.

[72] World Bank, "Worldwide Governance Indicators," (2019) http://info.worldbank.org/governance/wgi/index.aspx#home.
[73] *Id.*
[74] The Standardised Precipitation-Evapotranspiration Index (SPEI), https://spei.csic.es/index.html.

I will then turn to case studies of Venezuela, Syria, Turkey, Uzbekistan, focusing on periods of multi-year drought within each country. These studies seek to evaluate the effects of drought in each country and the impact of water management policy and infrastructure.

Data

Quantitative

The WGI Index of political stability and absence of violence (dependent variable) ranges from approximately -2.5 (weak) to 2.5 (strong).[75] This index is compiled from "a research dataset summarizing the views on the quality of governance provided by a large number of enterprise, citizen and expert survey respondents in industrial and developing countries…[it is] gathered from a number of survey institutes, think tanks, non-governmental organizations, international organizations, and private sector firms."[76]

The Standardised Precipitation-Evapotranspiration (SPEI) Index (independent variable) is "a multiscalar drought index based on climatic data. It can be used for determining the onset, duration and magnitude of drought conditions with respect to normal conditions in a variety of natural and managed systems such as crops, ecosystems, rivers, water resources, etc."[77] It uses a numerical range similar to the WGI index, however, the data is specific to predetermined areas of land shown as pixels. As a result, I have compiled the average of the pixels within Venezuela and Syria.

The data used is from 2004 to 2017. The WGI index is annual and I calculated the annual averages from the SPEI. I ran three separate regressions in an effort to account for the delayed onset of drought impact. The first regression matches the WGI and SPEI indexes by year (i.e. 2006 with 2006). The second matches the SPEI index with the WGI index of the following

[75] World Bank, WGI.
[76] *Id.*
[77] SPEI.

year (i.e. 2006 with 2007). The third matches the SPEI index with the WGI index two years later (i.e. 2006 with 2008).

The most important values for the purposes of this study are the p-value and the r-squared value. There are relatively low p-values for each regression, particularly the third regression, indicating that we can generally reject the null hypothesis that there is no effect. The r-squared values for each regression are as follows: first regression = .062; second regression = .059; third regression = .124. These values give us the proportion of the dependent variable (WGI) that can be explained by the independent variable (SPEI). As a result, this model shows that drought accounts for approximately 6 percent, 6 percent, and 12 percent, respectively, of variation of political stability. The third regression shows the greatest relationship, which is perhaps expected due to the delayed effects of drought. While 12 percent is a relatively low number, it does suggest somewhat of a relationship when accounting for every other potential variable that may impact political stability. Below are the scatterplots of each specific regression. The independent variable (SPEI) is along the x-axis and the dependent variable (WGI) is along the y-axis. Correlation between the two variables is measured by assessing the form, direction, and strength of the data represented on the plot.

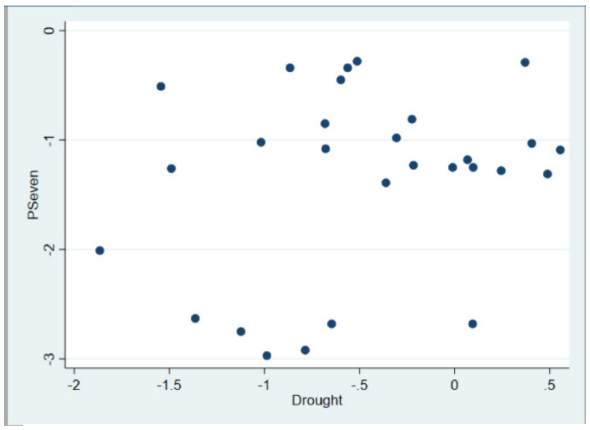

Figure 2 - *First Regression (Even Years)*

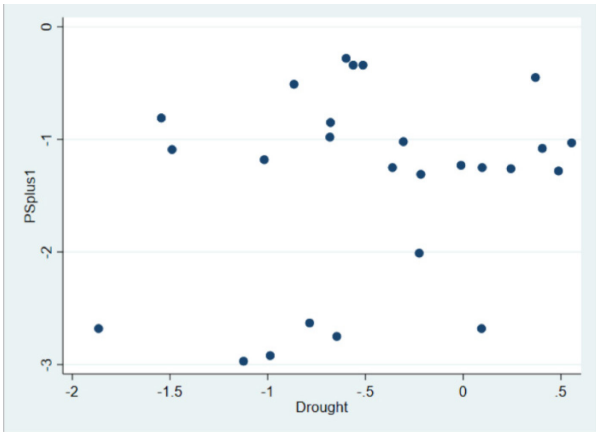

Figure 3 - *Second Regression (Plus 1 Year)*

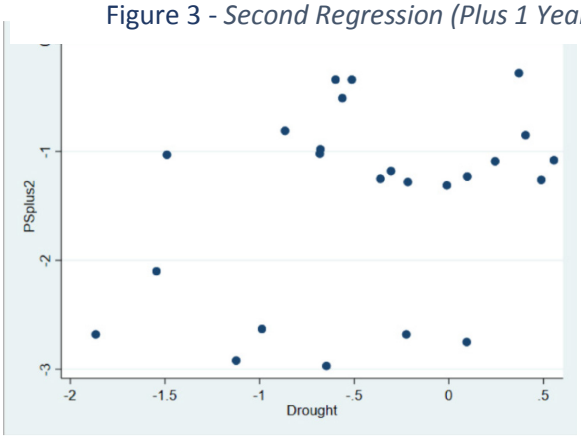

Figure 4 - *Third Regression (Plus 2 Years)*

Case Studies: Venezuela

Venezuelan meteorologists reported that the multi-year drought from 2013 to 2016 is the nation's worst in at least four decades, with nearly the entire country impacted.[78] During this period, precipitation levels were approximately 50 to 65 percent below average.[79] Agricultural production was directly affected, causing a drastic reduction in rice, corn, and coffee yield, and the national livestock herd was indirectly impacted.[80] Agriculture accounted for only

[78] Schneider, *supra*.
[79] Jean Chemnick, "Where Climate Change Fits into Venezuela's Ongoing Crisis," *Scientific American E&E News: Climate,* (February 18, 2019).
[80] Lieutenant Commander Oliver-Leighton Barrett, "Venezuela: Drought, Mismanagement and Political Instability," *The Center for Climate and Security,* (Feb. 7, 2019), https://climateandsecurity.org/2019/02/07/drought-mismanagement-and-political-instability-in-venezuela/.

approximately five percent of the national GDP.[81] However, approximately 60 percent of electricity generation in Venezuela comes from hydropower,[82] with the majority from the Guri dam in the northeastern part of the country.[83] Speaking to the effects of the drought, the Venezuelan Energy Minister announced in March 2018 that the Fabricio Ojeda dam in the western part of Venezuela was operating at 150 megawatts, well short of its capacity of 1,100 megawatts. Simultaneously, it was announced that Venezuela was limiting electricity nationwide by 14,000 megawatts during periods of peak usage.[84]

The drought emerged in the background of the aforementioned socioeconomic and political turmoil. A wealthy country due to natural oil reserves, responsible for approximately 95 percent of export revenue and half of total revenue, Venezuela is more oil dependent than Saudi Arabia.[85] In January 2010, Chavez devalued the currency in order to increase oil revenue in the face of declining prices, which has led to a variety of ensuing monetary issues.[86] Despite these efforts of currency manipulation, a 2014 drop in oil prices proved devastating to the economy.[87] It resulted in a 40 percent devaluation of the state-owned Petroleos de Venezuela (PDVSA).[88] As a result of the economic devastation, Maduro announced in November 2014 that he would reduce government spending.[89]

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[81] The World Bank, "Agriculture, forestry, and fishing, value added (% of GDP), https://data.worldbank.org/indicator/NV.AGR.TOTL.ZS?locations=VE.
[82] IEA International Energy Agency, "Statistics, Venezuela 2016," https://www.iea.org/statistics/?country=VENEZUELA&year=2016&category=Electricity&indicator=ShareElecGenByFuel&mode=chart&dataTable=ELECTRICITYANDHEAT.
[83] Ian Bremmer, "Venezuela Goes from Bad to Catastrophe," *Time Magazine,* Vol. 187(21) (June 6, 2016).
[84] Anggy Polanco and Isaac Urrutia, "Venezuela begins power rationing as drought causes severe outages," *Reuters: World News*, (Mar. 16, 2018), https://www.reuters.com/article/us-venezuela-blackouts/venezuela-begins-power-rationing-as-drought-causes-severe-outages-idUSKCN1GS2M5.
[85] Gillian B. White and Bourree Lam, *"What's at Stake in Venezuela's Economic Crisis," The Atlantic* (July 5, 2016), https://www.theatlantic.com/business/archive/2016/07/venezuela-economic-crisis/490031/.; Barrett, *supra.*
[86] BBC, "Venezuela Timeline," https://www.bbc.com/news/world-latin-america-19652436.
[87] White, *supra*; Barrett, *supra.*
[88] White, *supra*.
[89] BBC, "Venezuela," *supra.*

The resulting economic turmoil has been a substantial factor in the government's inability to provide "even rudimentary law and order," leading to the capital city of Caracas having one of the highest murder rates in the world.[90] There are also significant food security concerns, with 93 percent of Venezuelans unable to afford adequate food as of 2017[91] and nearly three-quarters of the population involuntarily losing an average of 19 pounds.[92] U.S. sanctions have led to further deprivations, while simultaneously providing Maduro ammunition for his claims that the issues facing Venezuela are the result of a U.S. led conspiracy, as well as the persistent drought.[93] The Maduro government enacted electrical and water rationing in April 2016, including a two-day work week, a four-day school week, and limitations of power transmission to manufacturers.[94] These shortages have extended beyond 2016, having a significant economic and social impact. Venezuela's western cities have felt the effects of water scarcity and power outages most severely:

> Business has all but ground to a halt at a time when the OPEC nation of 30 million is already suffering hyperinflation and a profound recession. Many Venezuelans are unable to eat properly on salaries of just a couple of dollars per month at the black market rate, sparking malnutrition, emigration, and frequent sights of Venezuelans digging through trash or begging in front of supermarkets.[95]

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[90] Moises Naim and Francisco Toro, *Venezuela is Falling Apart*, THE ATLANTIC (May 12, 2016) *available at* https://www.theatlantic.com/international/archive/2016/05/venezuela-is-falling-apart/481755/.
[91] "Venezuela's Agony," *The Economist* (July 29, 2017) at 9.
[92] Uri Friedman, "How Populism Helped Wreck Venezuela," *The Atlantic* (June 4, 2017) *available at* https://www.theatlantic.com/international/archive/2017/06/venezuela-populism-fail/525321/.
[93] Friedman, *supra*; Barrett, *supra*.
[94] Schneider, *supra*; Chemnick, *supra*; Barrett, *supra*.
[95] Polanco, *supra*.

Contrary to the Maduro government narrative that drought is to blame for water scarcity,[96] resource access and availability issues preexisted the 2013 drought. The country has substantial water reserves; however, 85 percent are in the sparsely populated southeast. Only 15 percent of the water reserves are directly available to the more heavily populated portions of the country.[97] Approximately 80 percent of the population lives in the north and west of the country, with 90 percent living in urban areas.[98] Infrastructure investments to address these geographical complications began in the 1950's and continued through the 1960's, however, they subsided in the ensuing decades. The late 1980's saw the decentralization of the Venezuelan water authority into ten regional governing bodies in response to widespread complaints about the effectiveness of water management. In the 2000's, Chavez further fractured water management into "7,000 community 'roundtables,'" which ultimately failed, while simultaneously nationalizing a number of industries, including electricity.[99] Ironically, water management was a policy priority for Chavez at the time of his 1999 election in an effort to maintain widespread political support among the nation's poor. For a time, Venezuela was even recognized internationally for "its water 'community-managed infrastructure projects.'"[100] However, limited investment, inadequate maintenance, and ineffective implementation in the ensuing years led to a rapidly deteriorating water and electrical infrastructure.[101]

What the government did invest, $10 billion towards water and $60 billion toward electricity infrastructure between 2006 and 2010, was largely ineffective.[102] For instance, public

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[96] Barrett, *supra*.
[97] Julia Buxton, "Venezuela: how a water crisis brought an entire country to its knees," *The Conversation* (June 7, 2016), https://theconversation.com/venezuela-how-a-water-crisis-brought-an-entire-country-to-its-knees-59932?curator=MediaREDEF.
[98] Humberto Marquez, "Venezuelans Thirsty in a Land of Abundant Water," *Tierramerica – Inter Press Service,* (June 4, 2014), http://www.ipsnews.net/2014/06/venezuelans-thirsty-in-a-land-of-abundant-water/.
[99] Buxton, *supra.*
[100] Jessica Brassington, "The Example of Venezuela: How Water Mismanagement Led to Disaster," *Impakter* (May 23, 2016), https://impakter.com/example-venezuela-water-mismanagement-led-disaster/.
[101] *Id.*
[102] Buxton, *supra.*

water systems around the capital city of Caracas, with a population of two million, are reliant on a network of pumps due to the city's elevation above sea level. Thermoelectric plants are positioned to act as reserve sources of power in the event that the national electric grid fails, such as resulting from diminished hydroelectric generation. However, according to a former state water official, "90 percent of the thermoelectric plants are out of service because they haven't been repaired, maintained or are disconnected from the electrical system."[103] "Highly deteriorated" infrastructure is endemic,[104] resulting in "perennial" water rationing irrespective of drought and water at the Guri dam reaching critical levels in non-drought years, including 2007 and 2010 – indicative of management issues largely independent of the 2013 multi-year drought.[105] Recent efforts to reinvigorate the electrical grid, including the increase of hydroelectric capacity, have stalled.[106]

Maduro's political opposition claims that the current situation is structural, as opposed to circumstantial: the result of continuous "corruption, incompetence….and the politicization of the public-utility companies in charge."[107] Rather than well-considered and implemented water management and electrical infrastructure projects, "the government has continued ad hoc and unaffordable nationalization programmes."[108] Experts suggest that "management has been poor due to high ministerial turnover and a lack of technical capacity, while administrative waste and profligacy thrived due to poor oversight and limited accountability."[109] This systemic

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[103] Arelis R. Hernandez, "'Why are you crying, mami?' In Venezuela, the search for water is a daily struggle," *The Washington Post* (April 4, 2019), https://www.washingtonpost.com/world/the_americas/why-are-you-crying-mami-in-venezuela-the-search-for-water-is-a-daily-struggle/2019/04/04/39972ce4-5547-11e9-814f-e2f46684196e_story.html.

[104] Alejandro Velasco, appearing on the Podcast "The Dig: Venezuela" (February 2, 2019), 27:30 minute, https://www.blubrry.com/jacobin/41457768/the-dig-venezuela/.

[105] Buxton, *supra.*

[106] Fabiola Zerpa and Pablo Rosendo Gonzalez, "Venezuela's Bid to Revive Key Power Plant Hits a Snag," *Bloomberg* (March 26, 2019), https://www.bloomberg.com/news/articles/2019-03-26/venezuela-s-bid-to-revive-key-power-plant-is-said-to-hit-a-snag.

[107] Hernandez, *supra.*

[108] Buxton, *supra.*

[109] *Id.*

deterioration extends beyond electrical infrastructure, as new drinking water treatment plants have not been built for nearly two decades and current plants are increasingly failing, leaving insufficient drinking water despite Venezuela being identified by the United Nations as a top-20 country for freshwater renewable resources.[110] Cutbacks in government spending and the current socioeconomic and political crisis complicate any efforts to address these systemic failures.[111]

Political opposition has grown, including anti-government protests in February and March 2014 that led to the deaths of 28 civilians. Hundreds of thousands of Venezuelans took to the streets to call for Maduro's resignation in September 2016.[112] A controversial constitutional assembly was elected in July 2017, which Maduro claimed would lead to an improved Venezuelan economy less dependent on oil.[113] Despite these claims, millions of Venezuelans fled the country during the drought and its aftermath. Growing protests made a "slide into generalized violence" possible as "signs of anarchy [emerged], with radicals on both sides slipping loose from their leaders' control. Rather than a second Cuba or a tropical China, *chavista* Venezuela, with its corruption, gangs, and ineptitude, risks becoming something much worse."[114] Conflict between supporters of the Maduro regime, *colectivos*, and the opposition forces, *Resistencia*, has increased.[115] Some experts have noted that recent protests have emerged from poorer regions due in large part to the collapse of basic services, such as water and electricity. This is a notable shift from the largely political protests of prior years.[116] In

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[110] Marquez, *supra.*
[111] Buxton, *supra.*
[112] BBC, "Venezuela," *supra.*
[113] "Venezuela: A Deadly Blow to Democracy," *The Economist* (Aug. 5, 2017):25, at 26.
[114] "Venezuela's agony," *supra* at 9.
[115] "A Deadly Blow," *supra* at 25-26.
[116] Velasco, *supra* at 14:15 min; *see also* Mary Beth Sheridan and Marianna Zuniga, "Maduro's muscle: Politically backed motorcycle gangs known as 'colectivos' are the enforcers for Venezuela's authoritarian leader," *The Washington Post* (March 14, 2019), https://www.washingtonpost.com/world/the_americas/maduros-muscle-politically-backed-motorcycle-gangs-known-as-colectivos-are-the-enforcers-for-venezuelas-authoritarian-leader/2019/03/13/2242068c-4452-11e9-94ab-d2dda3c0df52_story.html.

March 2019, violence erupted in Caracas as government forces fired upon protests regarding water shortages.[117]

From a migration standpoint, Venezuela's population of approximately 31 million is nearly twice that of Syria.[118] In 2017, the U.S. State Department noted an increased risk of extremism, as the Venezuelan government refused to cooperate with U.S. antiterrorism efforts for a tenth straight year,[119] highlighting an anti-American sentiment born in part from a relationship between Chavez and Mahmoud Ahmadinejad.[120]

Syria

Between 2007 and 2012, Syria experienced one of the worst long-term droughts in its recorded history.[121] The drought was spearheaded by the winter of 2007 and 2008, which was substantially drier than any other winter in the region since the advent of measuring technology.[122] Periods of at least three consecutive years of below average precipitation are not a rarity in Syria.[123] However, the three year period beginning in the winter of 2007 was the most severe three year drought in recorded history for the entire Fertile Crescent.[124] This created a significant water deficit in Syria, with 2011 annual withdrawal of renewable water sources reaching 160 percent.[125] The United States Department of Agriculture reported in its Foreign

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[117] Hernandez, *supra.*
[118] CIA, "The World Factbook: Venezuela," https://www.cia.gov/library/publications/the-world-factbook/geos/ve.html.
[119] U.S. Department of State, Chapter 2, Country Reports: Western Hemisphere Overview, Bureau of Counterterrorism and Countering Violent Extremism, https://www.state.gov/j/ct/rls/crt/2015/257519.htm.
[120] Emanuele Ottolenghi and Joan Hannah, "In Venezuela's Toxic Brew, Failed Narco-State Meets Iran-Backed Terrorism," *Foreign Policy* (Mar. 23, 2017), http://foreignpolicy.com/2017/03/23/in-venezuelas-toxic-brew-failed-narco-state-meets-iran-backed-terrorism/.
[121] Francesco Femia, Troy Sternberg, and Caitlin E. Werrell, "Climate Hazards, Security, and the Uprisings in Syria and Egypt," *Seton Hall Journal of Diplomacy and International Relations*, (Fall/Winter 2014): 73,74.
[122] Colin P. Kelley, et. al., "Climate change in the Fertile Crescent and Implications of the recent Syrian drought," *Proceedings of the National Academy of Sciences of the United States of America,* Vol. 112(11) (March 17, 2015): 3241-3246, 3243.
[123] *Id.* at 3243.
[124] *Id.* at 3241.
[125] *Id.* at 3243.

Agricultural Service Commodity Intelligence Report that the vast majority of Syrian vegetation was effected in 2007 and 2008 (97.1 %).[126]

The Syrian economy is heavily dependent upon agricultural production, as it accounted for approximately 25 percent of the Syrian GDP prior to the drought. In 2008, that percentage dropped to 17 percent[127] and by 2010 it was heavily dependent on wheat imports after years of mostly exporting.[128] Decreased precipitation and agricultural dependency was accompanied by years of shortsighted agricultural and water management policies, preceding the current regime of Bashar al-Assad.

Syrian agricultural policy has long focused on self-sufficiency, leading to a number of irrigation projects around the turn of the century, in an effort to prioritize "strategic crops." This focus, according to the World Bank, led Syria to be overly reliant on groundwater extraction and dam reservoirs. Increasing groundwater withdrawals and decreasing precipitation led to falling water levels and increased salinity.[129] In an effort to increase political support among rural farmers, former President Hafez al-Assad pushed policies to aid agricultural yield, such as "land redistribution and irrigation projects, quota systems, and subsidies for diesel fuel."[130] Irrigation projects between 2002 and 2008 proved largely ineffective, despite a $15 billion investment. The government continued to prioritize water needy crops such as cotton and wheat, as they were viewed "as part of [the nation's] identity and a bulwark against foreign dependence."[131] It

[126] Femia, *supra* at 74.
[127] *Id.* at 3241.
[128] *Id.* at 3247.
[129] Lina Eklund and Darcy Thompson, "Differences in resource management affects drought vulnerability across the borders between Iraq, Syria, and Turkey," *Ecology and Society* 22(4) (2017):9, 14.
[130] Kelley at 3241.
[131] Robert F. Worth, "Earth Is Parched Where Syrian Farms Thrived," *N.Y. Times* (Oct. 13, 2010) *available at* https://www.nytimes.com/2010/10/14/world/middleeast/14syria.html.

also nationalized grazing areas, which led to significant overgrazing and substantial desertification of critical agricultural areas during the drought.[132]

These policies placed a great deal of stress on Syria's already limited water resources, most importantly groundwater.[133] Poor management, waste, and overuse led to a 50 percent reduction in national water resources between 2002 and 2008.[134] Recognizing the critical overuse of groundwater, a 2005 law requiring a license for extraction was passed, but has been largely ineffective in preventing illegal withdrawals.[135] Satellite analysis of vegetation productivity indicates that agricultural productivity was further hampered due to overuse of the land.[136] The Syrian government formally acknowledged the scarcity and agricultural issues around 2010 and made some efforts to address the shortages.[137]

Ultimately, "poor governance and unsustainable agricultural and environmental policies" made Syria woefully unprepared for the extended drought.[138] It is important to note that historically, Syrian access to water has been impacted by its upstream neighbor Turkey. However, during the recent drought Turkey increased downstream flow via the critical Euphrates and Tigris rivers. Syria's vulnerability was primarily due to a reliance on annual rainfall, declining groundwater reserves, heavy dependence on agriculture - particularly in the Northeast - and an increased resource demand as compared to previous droughts.[139]

The impact on agriculture was most severe north of the Euphrates river, an area heavily occupied by the Kurdish minority.[140] Assad's ongoing attempts at "liberalizing" the economy,

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[132] Francesca De Chatel, 'The Role of Drought and Climate Change in the Syrian Uprising: Untangling the Triggers of the Revolution," *Middle Eastern Studies,* 50(4); 521-535, 523.
[133] Kelley at 3241.
[134] Worth, *supra*.
[135] Kelly at 3241.
[136] Eklund, *supra* at 14.
[137] Worth, *supra*.
[138] Kelley, *supra* at 3241.
[139] *Id.* at 3242-43.
[140] Worth, *supra*.

which included reducing numerous food subsidies, heightened the effect of production declines.[141] Food prices increased and poverty became increasingly severe.[142] This contributed to one and a half million Syrians relocating from rural areas to the peripheries of cities, areas that were already inflated due to population growth and Iraqi refugees.[143] As of 2010, 20 percent of the urban population was either displaced Syrians or Iraqi migrants, accounting for an increase from just under 9 million to nearly 14 million urban dwellers since 2002.[144] According to a 2009 report by the United Nations and International Red Cross, "over 800,000 Syrians had lost their entire livelihoods." A 2011 UN Global Assessment Report of Disaster Risk Reduction found that approximately one million were "extremely food insecure."[145] As of 2011, the UN estimated that about 9 to 13 percent of the population (2 to 3 million) were living in extreme poverty.[146]

The now overpopulated urban peripheries became central to the growing civil unrest.[147] The circumstances leading to the ultimate uprising in Syria are highly complex and clearly not the sole result of drought.[148] It was in large part due to "marginalised [sic] social groups with a strong role played by poorer segments in the society, particularly rural and rural-to-urban migrants…."[149] However, "the [internal] migration in response to the severe and prolonged drought exacerbated a number of the factors often cited as contributing to the unrest, which include unemployment, corruption, and rampant inequality. The conflict literature supports the

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[141] Kelley, *supra* at 3242.
[142] Mark Fischetti, "Climate Change Hastened Syria's Civil War," *Scientific American* (March 2, 2015), https://www.scientificamerican.com/article/climate-change-hastened-the-syrian-war/.
[143] Kelley, *supra* at 3242.
[144] *Id.* at 3242.
[145] Femia, *supra* at 74.
[146] *Id.* at 74.
[147] Kelley, *supra* at 3242.
[148] Shamel Azmeh, "The Uprisings of The Marginalised: A Socio-Economic Perspective of the Syrian Uprising," *London School of Economics: Middle East Centre Paper Series (06),* (Nov. 2014): 4.
[149] *Id.* at 3.

idea that rapid demographic change encourages instability."[150] While the factors behind civil unrest are never simple or singular,[151] the evidence suggests that the multi-year drought had a significant human and economic impact.[152]

Turkey

As Syria's northern neighbor, southeastern Turkey experienced similar drought effects between 2007 and 2012.[153] It is important to distinguish the climates of eastern and western Turkey, as the latter's weather is heavily influenced by the North Atlantic Oscillation and the Mediterranean, whereas eastern Turkey, Syria, and much of the Fertile Crescent are more prone to drought and desertification.[154] Despite the shared drought conditions, water scarcity was much less severe in southeastern Turkey than in neighboring Syria. Turkey was better prepared due in large part to "geographic diversity and investment in the southeast region's irrigation."[155] Whereas Venezuelan water management projects were left unfunded and Syrian irrigation projects proved ineffective, Turkey effectively implemented critical water infrastructure in the southeast. Turkey withdrew 20 percent of renewable water resources in 2011, compared Syria's 160 percent withdrawal rate.[156]

Exemplifying the difference in the drought management policies of Syria and Turkey are their respective agricultural yields. Southeastern Turkey and northeastern Syria, the nation's agricultural epicenter, grow many of the same crops.[157] Vegetation analysis during the drought

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[150] Kelley, *supra* at 3242.
[151] *Id.* at 3245.
[152] Femia, *supra* at 74.
[153] Eklund, *supra* at 9.
[154] Kelley, *supra* at 3243; Food and Agriculture Organization of the United Nations (UN FAO), "Drought characteristics and management in Central Asia and Turkey" (2017), xvii, http://www.droughtmanagement.info/literature/FAO_Drought_characteristics_and_Management_in_CAsia_Turkey_2017.pdf.
[155] Kelley, *supra* at 3243.
[156] *Id.* at 3243.
[157] Eklund, *supra* at 10.

indicates that Turkey saw slight improvement in agricultural productivity, while Syria experienced a decline.[158] This variance "highlights the role government and private sector resource management and infrastructure play in reducing drought vulnerability."[159]

Compared to Syria, Turkey's geographic location upstream on the Tigris and Euphrates rivers is favorable and has aided the country in its ability to maintain a water surplus. While Turkey was willing to increase downstream water flow in both rivers during the drought, extensive construction of hydroelectric plants and irrigation infrastructure has led to decreased flow and Syrian accusations of water treaty violations.[160]

Despite the geographic advantage, it appears that water management and effective infrastructure are what distinguished southeastern Turkey's ability to cope with the drought from Syria. Turkey decentralized and privatized its hydroelectric sector beginning in the 1980's, "which led to further water infrastructure developments as private actors constructed and managed dams, water plants, and irrigation systems under the 'build-operate-transfer' model introduced by the government."[161] Investments and implementation continued throughout the 1990's, in a concerted effort to address environmental risks associated with "rapid urbanization and industrialization" throughout Turkey. Much of this infrastructure development was spurred by Turkey's attempt to join the European Union in 1999. The EU required that Turkey comply with the European Union "Water Framework Directive" (WFD):

> This led to the expansion and intensification of the government's resource management policies. Development plans included water management provisions aimed at

[158] *Id.* at 11.
[159] *Id.* at 9.
[160] *Id.* at 14; Peter Schwartzstein, "Amid Terror Attacks, Iraq Faces Water Crisis," *National Geographic* (Nov. 5, 2014), https://news.nationalgeographic.com/news/2014/11/141104-iraq-water-crisis-turkey-iran-isis/.
[161] Eklund, *supra* at 14.

> lessening the impact of drought and frequency of water shortages. (citation omitted). The ongoing refinement of Turkey's water management policies, combined with the significant public and private investments made in regulation provisions, meant that at the time of the 2007-2009 drought, Turkey was considerably better positioned to deal with the impacts of drought than its neighbors Iraq and Syria.[162]

In addition, Turkey is involved in numerous collaborative efforts to limit drought risk.[163] Notably, it was a founding member of the Drought Management Centre for Southeastern Europe in 2007, an organization partially financed by the European Union.[164] Its mission is "to coordinate and facilitate the development, assessment and application of drought risk management tools and policies in South-Eastern Europe with the goal of improving drought preparedness and reducing drought impacts."[165]

Importantly, Turkey has had the economic capability over the previous decades to invest and implement the necessary policies and infrastructure. This includes both the aforementioned international efforts, but also national efforts such as the Turkish Agricultural Drought Action Plan, "which outlines priority areas to address preparedness and drought mitigation measures.[166] Turkey's involvement in both national and international efforts, as well as the economic and political capability to invest and implement as necessary, allowed it to escape the socioeconomic stress experienced in Syria, despite facing down the Fertile Crescent's

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[162] *Id.* at 14.
[163] UN FAO, *supra* at xviii.
[164] *Id.* at xviii.
[165] Drought Management Centre for Southeastern Europe, "Home," http://www.dmcsee.org/.
[166] UN FAO, *supra* at xvii.

worst recorded drought in 900 years.[167] This is not to suggest that Turkey's water management policies represent the gold standard. National response to drought is still primarily reactive and there is not yet a fully comprehensive drought management strategy"[168] Turkey was just substantially better equipped than Syria to handle the effects of the 2007 multi-year drought due to the steps it had taken.

Uzbekistan

Uzbekistan, like most of Central Asia, is generally arid and drought is quite common. However, between 2000 and 2001 the region experienced an abnormally severe and lengthy drought.[169] Specific to Uzbekistan, this drought was uniquely severe due to its wide-ranging effects on the economy, water reserves, environment, and its citizenry, particularly in rural areas.[170] Uzbekistan is highly dependent upon agriculture, accounting for 17 percent of GDP, 27 percent of employment, and 22 percent of export income. In addition, 70 percent of domestic trade is centered around agricultural production, and domestic production accounts for 90 percent of demand.[171] The vast majority of agricultural production occurs on irrigated land (90 percent) and the industry accounts for 92 percent of total water use.[172] This heavy usage along with a major dependence on the continually drying Aral Sea Basin leave a number of communities highly vulnerable to limited fresh water supplies.[173]

The drought led to reduction in cereal grain production between 14 and 17 percent and other crops between 45 and 75 percent. Estimates have varied as to the total economic cost of reduced yields, ranging from $40 million to $130 million, or 2.4 percent of GDP.[174] Outside of

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[167] Eklund, *supra* at 9.
[168] UN FAO, *supra* at xvii.
[169] *See generally id.*
[170] *Id.* at 15.
[171] *Id.* at 25.
[172] *Id.* at 26
[173] *Id.* at 26, 36
[174] *Id.* at 36.

agricultural yield, the drought resulted in water resource declines of 20 to 30 percent regionally and 35 to 80 percent nationally.[175] There were significant socioeconomic impacts and a related increase in migration out of Uzbekistan.[176]

Despite government efforts to alleviate the drought's impacts by providing financial and technological support to the most affected regions, a "lack of inter-agency coordination, water use control, and failure in water supply" ultimately made such efforts largely unsuccessful.[177] The United Nations Development Programme (UNDP) determined that "the most dramatic reductions in agricultural production took place due to insufficient planning, forecasting, and water resource control at regional, national and local levels."[178]

Uzbekistan did have the benefit of a largely intact and generally maintained water infrastructure left over from the Soviet era, unlike other Central Asian countries.[179] However, the Soviet infrastructure had its own technical challenges, as it was designed for a generally larger scale and was not as effective in the aftermath of the Soviet collapse, as Uzbekistan's agricultural land was broken into smaller farms. In addition, effective management of the existing infrastructure required a technical expertise and institutional assemblance that Uzbekistan did not have in place.[180] Increased demand, the lack of a coordinated national water management effort, and infrastructure not best suited for the particularities of an independent Uzbekistan, was further aggravated by the citizens continued treatment of water as a "free good," as it was viewed during the Soviet era."[181] Further impacts were felt due to a political

[175] *Id.* at 36.
[176] *Id.* at 36-37.
[177] *Id.* at 48.
[178] *Id.* at 36.
[179] *Id.* at 47.
[180] *Id.* at 72.
[181] *Id.* at 18.

emphasis on economically beneficial "cash crops," leading to some water divergence from many downstream users.[182]

Discussion

The quantitative data is an admittedly blunt and imperfect tool for this research question. There are many "markers" which can be used to assess the socioeconomic and political well-being of a nation, and the WGI index provides a singular assessment, which certainly does not capture the full extent of civil unrest or any other variation of intrastate conflict. The SPEI drought index has its own limitations, as the data used is an annual average for the entire country and does not account for geographically significant areas, such as the Guri dam in Venezuela. It is ultimately an imperfect tool as used in this study for assessing the broader question of a scarcity-conflict relationship. However, it does provide a useful starting point, as the data shows some relationship between the two variables, although perhaps minor. Most useful is the third regression which accounts for a two-year delay for the effects of drought, suggesting that 12 percent of the variation of the WGI variable is related to the SPEI drought index. This is not insignificant, as it does suggest a relationship between the two variables.

The totality of the effects of the 2013 drought are difficult, if not impossible, to quantify. The quantitative data provides some support that drought may be a factor in civil unrest in Venezuela and Syria during those specific time periods. Additional measures, such as a steadily declining GDP since 2013, a massive influx in migration, reductions in agricultural yield, and government enacted electrical and water rationing further suggest that the socioeconomic and political crises in Venezuela was aggravated by the drought. Again, it is difficult to assess to

[182] *Id.* at 75.

what degree many of these factors are related to the drought, particularly when it occurred in the background of such significant factors as currency manipulation, the 2014 drop in oil prices, and countless failed policies. The case studies provide significant insight into the role of water scarcity, drought, and water mismanagement in the Venezuelan situation.

There is a critical distinction between Venezuela and the other nations in this study: the reliance on agriculture. For instance, the example of Syria provides a much more linear argument for the effect of drought on civil unrest and ultimate civil war. While there is certainly debate on the topic, the evidence is more supportive of a link: drought caused significant water and food scarcity issues, causing much of the rural population to migrate to urban centers where there was increased poverty and other demographic changes as discussed in the CNA report, which then led to the ultimate explosion of civil unrest. There is not such a clear linear progression of drought to civil unrest in Venezuela. While it is notable that such a large portion of Venezuelan's live in urban areas, where political and now more services-based protests have erupted, there is not the same instance of internal migration due to drought. Furthermore, there is every indication that many of the services-based issues, water and food security, preexisted the 2013 drought.

Venezuela did not face the same economic issues due to declining agricultural yield, as it was less reliant on agriculture as compared to both Syria and Uzbekistan. While there was certainly some monetary impact resulting from declining yield in Venezuela, its primary economic issues where due to inept monetary policy, an overreliance on a devaluing commodity, and a failing electrical grid. Both Syria and Uzbekistan faced significant socioeconomic consequences as a direct result of agricultural decline, something that the data above can more clearly point directly to drought, even if it was not the only culprit.

Despite its own management inadequacies, the case of Turkey helps highlight the true culprit of water scarcity in Venezuela, Syria, and Uzbekistan: failed water management policy. Venezuela, Syria and Uzbekistan lacked a comprehensive national approach to water management as outlined by the literature above, most notably the European Union, OECD, and UN. Each organization stressed the importance of a comprehensive and well-coordinated water management effort, that was forward thinking and encompassing of the necessary regional and national particularities. Such principles are consistent with the scholarly work addressing water management.

Turkey was better able to implement such water management policies, in part due its introduction to the EU framework in 1999, but also its economic capability and political will to take action. While Venezuela may at one time have had the economic capability to undertake the necessary institutional steps along with adequate investment, it lacked the political will and foresight. Rather, it relied on *ad hoc* water management and infrastructure solutions. It is unclear to what degree it now has either the economic capability or political will to take such steps. Syria provides a similar cautionary tale of *ad hoc* water management: it is simply inadequate to address what the OECD and the other literature makes clear is an "inherently complex" issue that is "strongly linked to domains that are critical for development."[183] While Uzbekistan was perhaps more responsive than both Venezuela and Syria, it still ultimately suffered from the same lack of a comprehensive management plan.

In their 2017 study regarding the water management policies of Syria, Turkey, and Iraq, Lina Eklund and Darcy Thompson concluded that:

> it becomes clear that the severity of the effects of the drought
> are the outcome of biophysical as well as political and

[183] OECD, *supra* at 2.

> socioeconomic factors. On a broader level, our study demonstrates that vulnerability to drought can be positively or negatively affected by resource management strategies. Looking only at the severity of the drought in terms of precipitation does not necessarily provide an accurate representation of the "effects" on the ground.[184]

Eklund and Thompson's conclusion mirrors that of the OECD when citing water scarcity as "often primarily 'governance' crises"[185] and Sowers in her distinction between drought statistics and water scarcity. Critical here is the understanding that water scarcity in many cases is an issue of poor management, and not necessarily linked to drought. Drought can exacerbate preexisting water scarcity resulting from poor management strategies or other socioeconomic factors. However, in Venezuela, poor water management policy, which included a crumbling infrastructure, played the role of Kaplan's "hostile power,"[186] as opposed to mother nature. The case of Venezuela is strong supportive evidence of Theisen's assertion that "proxies for development, state strength and institutional instability" are the true indicators of political instability.[187]

The data above makes a strong case that water scarcity played a significant role in the socioeconomic and political decline of Venezuela. However, water scarcity preexisted the drought and was largely independent of meteorological factors. Venezuela provides a shining example of Ido and Stang's assertion that scarcity issues in wealthy countries are the result of "prioritization, management, and governance," as opposed to environmental factors.[188] The

[184] Eklund, *supra* at 16.
[185] OECD, *supra* at3
[186] Kaplan, *supra* at 57-59.
[187] Thiesen, "Blood and Soil," *supra* at 814-15.
[188] Bar, *supra* at 3.

evidence shows that water scarcity in Venezuela was rooted in years of mismanagement, corruption, and countless other forms of poor governance. Water scarcity itself played a significant role in Venezuela's decline into civil unrest and economic turmoil, consistent with much of the conflict-scarcity literature detailed above. While many of these factors, specifically poor water management, made Venezuela more susceptible to the effects of the 2013 drought, it does not appear to have been a significant factor in Venezuela's decline. Analogous to how a healthy body and immune system may ward off a minor cold virus with little ill effect, but a weakened immune system may render the body highly vulnerable to that same virus, drought likely exacerbated the situation in Venezuela. However, it is clear that the primary contributor to water scarcity, a substantial factor in the Venezuelan decline, was poor management and not environmental scarcity resulting from the multi-year drought beginning in 2013.

Accordingly, my hypothesis must be revised from above. Water scarcity, stemming primarily from decades of inept water management, to include lack of investment and implementation of infrastructure, played a substantial role in the current socioeconomic and political disorder in Venezuela. This preexisting water scarcity, as well as other socioeconomic and political factors, made Venezuela more vulnerable to the effects of the 2013 drought. To this degree, it is likely that the drought did contribute to some degree to Venezuelan instability. However, it would appear inaccurate to suggest that the drought itself "severely" aggravated the current situation, as preexisting governance issues proved to be the primary factor in water scarcity. Initially, the country's heavy reliance on hydropower seemed to be a clear vulnerability in the face of drought. However, it becomes quickly apparent that Sower's premise that water-energy related vulnerability is the primary result of infrastructure and policy rather than physical scarcity proved true in Venezuela. The impact of Venezuela's faltering electrical grid on the

socioeconomic situation is significant, as evidenced above. However, like most other issues, it was the result of inept governance that preexisted the drought.

Conclusion

It is apparent that water scarcity has played a significant role in the Venezuelan crisis, manifesting in the repeated failure of the hydroelectrical grid, water rationing, and other associated issues. In this manner, water scarcity has had a profound socioeconomic impact in Venezuela. It is, however, less apparent that the 2013 to 2016 drought played a significant contributory role in Venezuelan water scarcity. There is some data suggesting that the socioeconomic and political crisis was impacted by the drought. However, it is clear that many of these issues preexisted the drought, due to a crumbling infrastructure, limited investment, inept resource management, corruption, and geographical limitations. Venezuelan water scarcity, and the resulting impacts, were more directly linked to these failures of governance then the environmental phenomena between 2013 and 2016. The case studies confirm that government policy may either alleviate or exacerbate the effects of drought. While it seems that the drought effects aggravated many of these preexisting conditions, the lack of a comprehensive and effective water management plan is the primary culprit of water scarcity in Venezuela. Oil wealth could not save Venezuela from its own failed policies and short-sighted governance, as its failure to invest adequately in its own infrastructure created a water scarcity issue independent of drought.

Venezuela, like Syria and Uzbekistan, prove to be cautionary tales of the importance of effective water management in addressing the future effects of climate change, specifically the increased severity and duration of droughts. Further research into the link between climate change and conflict, as critiqued by Gleditsch and Nordas above, should adequately address the role of water management in limiting future conflict. Similarly, it will be interesting to see how

water management frameworks as suggested by the EU continue to evolve in the face of climate change. Other potential areas of future research include a more comprehensive quantitative analysis encompassing an index for water management, such as the aforementioned World Resources Institute's effort to create a "global comparable geodatabase of public water management indicators."[189]

[189] Kolbel, *supra*.

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